



**3 NUTRITION SERVICES**

*Effective: 12/1/95*

**3.14 Nutrition Risk Determination: Plotting Weight-for-Length, Length-for-Age, and Body Mass Index-for-Age**

*Revised: 4/1/03*

**POLICY:** For infants and children less than 24 months of age (and children age 24-36 months who cannot stand) measured in a recumbent position (length), weight-for-length and length-for-age measurements must be plotted on the Centers for Disease Control and Prevention, National Center for Health Statistics (CDC/NCHS) Birth - 36 Months growth charts (or the State WIC-produced versions). If the infant/child was preterm ( $\leq 37$  completed weeks gestation) and is less than 24 months of age, adjust for gestational age before plotting length for age. For children age 2 years and older and measured in a standing position (stature), Body Mass Index (BMI)-for-age and stature-for-age must be plotted on the CDC/NCHS Two - 20 Years charts (or the State WIC-produced versions).

**PROCEDURE:**

**A. TOOLS NEEDED FOR PLOTTING**

1. CDC/NCHS Growth Charts or State WIC-produced charts (see Attachments).
2. Infant Health and Development Program (IHDP) growth charts for premature very low birth weight and low birth weight infants (see Attachments) (optional).
3. Ruler or other plotting device (see Attachment for an example).
4. Tool for determining Body Mass Index (BMI), e.g., calculator, computer program, BMI wheel, or manual tables (see Attachment).

**B. LENGTH- OR STATURE-FOR-AGE PLOTTING PROCEDURE**

1. Select the correct chart for sex and length (recumbent) or stature (standing height) procedure. The CDC/NCHS Birth to 36 Months charts are based on length measurements. The CDC/NCHS Two - 20 Years charts are based on stature. (If the infant/child is preterm, i.e.,  $\leq 37$  completed weeks gestation, and  $< 24$  months of chronological age, see Part C.)
2. Determine the infant/child's age on the date which measurements are taken. Use the ADP system-generated age, or, to hand calculate the age, subtract the birthdate from the measurement date. If the "day" of the birthdate is larger than the "day" of measurement, borrow 1 month (30 days) from the *month of measurement* and add 30 days to the *day of measurement*. If the month of the birthdate is larger than the month of the measurement, borrow 1 year (12 months) from the *year of measurement* and add 12 months to the *month of measurement*.



Example (measurement date February 10, 1995; birthdate February 18, 1993):

	<u>Year</u>	<u>Month</u>	<u>Day</u>
		13	
Date of	4	<del>4</del>	40
Measurement	1995	<del>2</del>	<del>40</del>
Birthdate	- <u>1993</u>	<u>2</u>	<u>18</u>
Child's Age	= 1 year	11 months	22 days

3. When using a plotting device, look at the bottom axis on the chart (labeled Age) and approximate as closely as possible where the age point would be. Place the vertical line on the plotting device on this point. Look at the left axis (labeled Length or Stature) and approximate the point for the length or stature. Place the horizontal line on the plotting device on this point while retaining the position of the other line on the age axis.
4. Write the date at the intersection. The intersection point indicates the growth percentile. Growth charts show how each child's measurements compare with a sample of 100 U.S. children of the same sex and age. Each chart has a set of percentile curves with the numbers 5, 10, 25, 50, 75, 90, and 95 printed along the right-hand side. Each one shows the percentages of boys and girls in the U.S. population who are below that measurement. For example, if a child's length-for-age is at the 50th percentile, this means that of 100 children of the same gender and age, 50 are shorter than she.

### **C. ADJUSTING FOR GESTATIONAL AGE**

1. If the infant/child was preterm ( $\leq 37$  weeks completed gestation) and is currently less than 24 months of chronological age, adjust for gestational age, and use the adjusted (or corrected) age for plotting Length-for-Age.
2. To adjust for gestational age, determine the number of weeks born before the due date. Use a calendar and count the number of weeks plus days between the due date (on the Infant Questionnaire) and actual birth date. For infants, the due date is on the Infant Questionnaire. For 1 year olds not certified before, ask about due date if the child was low birthweight; on the Child Questionnaire. Round the number of days to the nearest week. Document the number of weeks premature on the growth chart. (Note: It is optional to enter the actual adjusted age in the table on the WIC-produced growth charts.)
3. To plot using adjusted age:



- a) If the adjusted age is <40 weeks gestation, it is recommended to plot weight-for-age and weight-for-length on the Infant Health and Development Program (IHDP) Low Birth Weight (1501 - 2500 gm) or Very Low Birth Weight (<1500 gm) charts (see Attachments), if the infant fits on them. (Note: Length-for-age does not go below an adjusted age of <40 weeks gestation). The minimum adjusted ages for the weight-for-age charts are -1 1/2 months on the LBW charts and almost -2 months on the VLBW charts. The minimum lengths on the weight-for-length charts are about 49.5 centimeters. While plots on IHDP charts cannot be used for risk factor determination (not yet allowed by USDA), the infant will still have a prematurity risk factor and will thus qualify for the WIC Program.
  - b) If the adjusted age is  $\geq 40$  weeks gestation, plot on the CDC/NCHS charts. Use the adjusted age for length-for-age risk factor determination.
  - c) Find the point on the Age axis of the chart that corresponds to the child's chronological age. Move the point to the left the number of weeks the child was premature. Follow the plotting procedures in part B. Write "adjusted" next to the date of the plot. Documenting the Adjusted Age in the table for date, etc., is optional.
4. If this is a first certification and there is concern about growth, it is recommended to plot at least one set of previous measurements (from birth or hospital discharge or a more current date) in order to see a trend (e.g., to see if growth is as expected or has faltered). If the adjusted age for the previous measurements is <40 weeks gestational age and thus the plots are on the IHDP charts, it is recommended to plot the current measurements on those charts (in addition to plotting the current measurements on the CDC/NCHS charts). Because the reference populations for the IHDP and CDC/NCHS charts are different, at least 2 sets of plots on the same charts are needed for comparison purposes.
  5. Do NOT consider parental stature when interpreting plots, since there is no medical research base to support doing this.

#### **D. WEIGHT-FOR-LENGTH PLOTTING PROCEDURE**

1. When using a plotting device, look at the bottom axis on the chart (labeled Length) and approximate as closely as possible where the infant/child's length point would be. Place the vertical line on the plotting device on this point. Look at the right axis (labeled Weight) and approximate the point for the weight. Place the horizontal line on the plotting device on this point while retaining the position of the other line on the length axis.
2. Write the date at the intersection.



## **E. BMI-FOR-AGE PLOTTING PROCEDURE**

1. BMI-for-Age is used to assess weight of children age 2 years and older whose stature was measured (i.e., standing position).
2. Select the correct BMI-for-age chart (boys or girls).
3. Determine the child's BMI in one of the following ways:

a) Use a calculator:

Convert the height and weight fractions to decimals.

1/8 inch = .1                      2/8 inch or 1/4 lb = .25

3/8 inch = .4                      4/8 inch or 1/2 lb = .5

5/8 inch = .6                      6/8 inch or 3/4 lb = .75

7/8 inch = .8

Calculate using the equation:  $\text{weight (lbs)} \div \text{height (inches)} \div \text{height (inches)} \times 703 = \text{BMI}$ . Round to the nearest tenth. (Note: Some calculators have a square function or a BMI function that can be used.)

- b) Use a computer program. One example is the Body Mass Index Calculator on the CDC growth charts web site ([www.cdc.gov/growthcharts](http://www.cdc.gov/growthcharts)).
  - c) Use a BMI calculator wheel. To use with most 2 year olds, a wheel needs to include heights of at least 30 inches. Markings of cut-offs for overweight, etc. should be based on current criteria (to avoid confusion).
  - d) Use manual BMI tables. (See Attachment, for children 2+ - 5 years of age.) These are the least specific and should be used when the above methods cannot be used.
4. Follow the procedure for age determination and plotting in parts B.2-4.
  5. Write the date at the intersection. The intersection point indicates the BMI-for-Age percentile. BMI charts show how each child's measurements compare with a sample of 100 U.S. children of the same sex and age. Each chart has a set of percentile curves with the numbers 5, 10, 25, 50, 75, 85, 90, and 95 printed along the right-hand side. Each one shows the percentages of boys and girls in the U.S. population who are below that measurement. For example, if a child's BMI-for-age is at the 50th percentile, this means that of 100 children of the same gender and age, 50 are shorter than she.



## F. RECORDING PERCENTILES

Recording percentiles on the Risk Factor/Flow Sheet is optional. To record plots that fall between percentile lines, write, e.g.: >10th<25th.

## G. ADJUSTING FOR PARENTAL STATURE

1. Parental stature can be considered in interpreting a child's length/height for stature percentiles, particularly those <5<sup>th</sup> percentile (except for preterms when adjusting for gestational age is done). Do not use adjusted plots for risk factor determination.
2. While knowing that parents are short or tall may be adequate for some assessment purposes, mathematical adjustments remove the influence of parental stature from the measured value and make it easier to recognize possible growth problems. Adjustments for children of short parents are added to measured lengths/heights. If one parent is short and the other is average, only half the adjustment is made. If one parent is short and the other is tall, an adjustment is not necessary. The table below (from Moore WM, Roche AF: Pediatric Anthropometry, ed 2. Columbus, OH, Ross Laboratories, 1983) shows adjustments which can be made to length/height.

Age (months)	Short Parents*		Tall Parents**	
	Boys	Girls	Boys	Girls
Birth	+ 3/8	+ 0	- 3/8	- 3/8
3	+ 6/8	+ 3/8	- 6/8	- 6/8
6	+ 6/8	+ 6/8	- 6/8	- 6/8
9	+ 6/8	+ 6/8	- 1 2/8	- 1 2/8
12	+ 6/8	+ 1 2/8	- 1 2/8	- 1 2/8
18	+ 1 2/8	+ 1 2/8	- 1 2/8	- 1 2/8
24	+ 1 2/8	+ 1 2/8	- 1 5/8	- 1 5/8
30	+ 1 5/8	+ 1 5/8	- 2	- 2
36	+ 1 5/8	+ 1 5/8	- 2	- 2

\* Mother 5 ft tall or less, father 5 ft 5 in tall or less.

\*\* Mother 5 ft 9 in tall or more, father 6 ft 4 in tall or more.

## H. CHILDREN WITH SPECIAL HEALTH CARE NEEDS

1. Growth charts have been developed for a number of conditions for which growth patterns are altered (see attachments). CDC recommends using the CDC/NCHS growth charts, not special charts, in all cases. However, recognizing the



limitations of these special charts, some clinicians may use them to illustrate how a specific condition can alter a child's growth potential.

2. Use of special charts for children who have conditions with no genetic or chromosomal basis for an altered growth pattern (e.g., cerebral palsy) is not recommended.
3. Alternate methods to assess linear growth when neither stature nor recumbent length can be accurately measured (e.g., scoliosis and leg contractures) include: crown-rump length and sitting height, upper arm length, and lower leg length. The measurements can be plotted on the NCHS charts for stature-for-age. Even if measurements fall below the 5<sup>th</sup> percentile, they establish a growth pattern over time. These procedures are recommended for assessing growth over time, but are not required. For more information, go to the CDC growth charts web site.
4. If weight, length, or stature measurements cannot be obtained, document the reason in the participant's file and enter "unknown" codes for weight and length or stature in the ADP system.

#### **I. ETHNIC-SPECIFIC GROWTH CHARTS**

Although growth charts for various ethnic groups exist, the Centers for Disease Control and Prevention (CDC) discourages their use. The reasons are: 1) It is not appropriate to compare children born in the U.S. to those born in their native homeland because children born in the U.S. tend to be larger; and 2) As children live in the U.S. longer, their growth tends to accelerate towards the NCHS percentiles, again making use of the other charts inappropriate. It is more important to monitor growth patterns, rather than individual measurements, since these patterns should still parallel the percentiles on the NCHS growth charts.

#### **ATTACHMENTS:**

- \* DPH 4518 Growth Charts for Girls
- \* DPH 4517 Growth Charts for Boys
- \* PPH 40018 Manual Body Mass Index Tables for Children Age 2-5 Years
- \* Preciseplot from Perspective Enterprises
- \* IHDP Premature Growth Charts (formula names eliminated with permission from Ross Products)
- \* Down Syndrome Growth Charts for Girls and Boys
- \* Achondroplasia Growth Charts for Males and Females
- \* Prader-Willi Syndrome Growth Charts for Males and Females
- \* Rubinstein-Taybi Syndrome Charts for Males and Females
- \* Turner Syndrome Charts for Girls
- \* Williams Syndrome Charts for Males and Females
- \* Acromion-Radiale Length and Knee-Height Growth Charts for Girls and Boys